Rhodora

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ON THE APPLICATION OF THE NAME ARNICA LESSINGII (TORREY & GRAY) GREENE

BASSETT MAGUIRE

THERE has come to my attention only recently a paper[1] on Canadian plants by Dr. Boivin in which he discusses *Arnica Lessingii* (Torr. & Gray) Greene. Unfortunately, Dr. Boivin has been led into an error of interpretation, no doubt as a result of one of citation made by me in my monograph of the genus.[2] Not only has Dr. Boivin misapplied the name *Arnica Lessingii* (Torr. & Gray) Greene, displacing this binomial by the otherwise properly applied *Arnica louiseana* Farr ssp. *frigida* (Meyer ex Iljin) Maguire (l. c. p. 209), but he has unwittingly proposed a new name *Arnica Porsildiorum* Boivin (l. c. p. 210) for the valid and correctly assigned *Arnica Lessingii;* thereby he adds one more hyponym to the distressingly long list in the genus *Arnica*, and further compounds the original error.

First of all (as all contemporary students of the genus have recognized), two distinct species are involved, both of trans-Bering distribution. *Arnica louiseana*, in Alaska the ssp. *frigida*, is a beautiful plant with large usually solitary and usually gracefully nodding heads, dense yellowish pilose subinvolucral pubescence, and *yellow anthers*. It belongs to the subgen. *Arctica* and is most closely related to *A. alpina* (L.) Olin. The second, *Arnica Lessingii*, also an attractive plant, is much less conspicuously pubescent, and has smaller sharply and stiffly

[1] Boivin, Bernard, Centurie de Plantes Canadiennes. Nat. Canad. 75: 202–227. 1948.

[2] Maguire, Bassett. A Monograph of the Genus Arnica. Brittonia 4: 386–510. 1943.

nutant heads, and *purple-black* anthers. This species belongs to the subgen. *Andropurpurea*, and is probably most closely related to *A. unalaschcensis* Less.

I agree entirely with Boivin that Greene clearly intended to make the transfer, or more accurately to elevate the status of Torrey and Gray's β *Lessingii* to specific rank; that he did so validly; and that it was not his intent to propose a new species (although most specimens annotated in Greene's hand as *A. Lessingii* are actually *A. louiseana frigida*, which at that time had no valid name).

The simple answer to the confusion so needlessly set off by me lies in the typification of the basonym *Lessingii.* The type is at the New York Botanical Garden. It consists of the single well-preserved specimen with a sharply and stiffly nutant head and *purple-black* anthers. The label bearing the printed designation "Torr. & Gray, Flora N. Amer." is annotated in Torrey's hand, "A. angustifolia β Lessingii". Thus, the type of *A. angustifolia* β *Lessingii* Torr. & Gray is definitely fixed and, it follows likewise, the type of *A. Lessingii* (Torr. & Gray) Greene. So, then also the application of the binomial *Arnica Lessingii* is definitely affixed to the clear-cut trans-Bering species with naked rhizomes, sharply nodding heads, and *purple* anthers.

Torrey and Gray (l. c. 1843) had misinterpreted *A. alpina* Lessing (which is *A. louiseana frigida*) and erroneously associated their β *Lessingii* with it, but at the same time had properly characterized their variety as having "anthers blackish," as indeed they are! Gray (l. c. 1884), probably lacking the type, which is at the New York Botanical Garden, not only erroneously transferred var. *Lessingii* to *A. alpina* var. *Lessingii*, but likewise characterized the anthers incorrectly as "not blackish." Obviously, he was not dealing with the population with black anthers. Greene (l. c. 1900) validly effected the nomenclatural transfer, whether or not under misinterpretation of specimens. Iljin (l. c. 1926) interpreted *A. Lessingii* (Torr. & Gray) Greene correctly, as did Rydberg (l. c. 1927), Hultén (l. c. 1937) and Maguire (l. c. 1943). However, Rydberg to some extent confused the synonymy by assigning *A. alpina* var. *Lessingii* Gray "in part" to *A. Lessingii* (Torr. & Gray) Greene, and "mainly" to *A. Sancti-Laurentii* Rydb. (= *A. louiseana* ssp. *frigida*).

Maguire further confused the synonymy by erroneously assigning *Arnica angustifolia β Lessingii* Torr. & Gray to *Arnica louiseana* ssp. *frigida,* while at the same time correctly assigning *Arnica alpina* var. *Lessingii* Gray to that entity. My bracketing together the citation of these two distinct entities in the synonymy of *Arnica louiseana* ssp. *frigida,* is a *lapsus* that I cannot explain.

Boivin (l. c. 1948) misinterpreted *Arnica Lessingii* (as a result, no doubt, of my error of citation), applying the name to plants that properly come under the trinomial *Arnica louiseana* ssp. *frigida;* and proposed the hyponym *Arnica Porsildiorum* Boivin for properly applied *Arnica Lessingii* (Torr. & Gray) Greene.

The correct names, proper authorities, and pertinent synonymy for the two species discussed are as follows:

ARNICA LOUISEANA Farr subsp. frigida (Meyer ex Iljin) Maguire, Madroño **6:** 153. 1942. *A. alpina* Less. Linnaea **6:** 233. 1831; Herder, Bull. Soc. Nat. Mosc. **40:** 423. 1867. Not (L.) Olin, Diss. 11. 1799. *A. alpina* var. *Lessingii* Gray, Syn. Fl. N. Am. **1²:** 383. 1884, not *A. angustifolia β Lessingii* Torr. & Gray, Fl. N. Am. **2:** 449. 1843. *A. nutans* Rydb. N. Am. Fl. **34:** 328, 1927. *A. Sancti-Laurentii* Rydb. N. Am. Fl. **34:** 328. 1927. *A. brevifolia* Rydb. N. Am. Fl. **34:** 329. 1927. *A. Mendenhallii* Rydb. N. Am. Fl. **34:** 329. 1927. *A. Illiamnae* Rydb. N. Am. Fl. **34:** 331. 1927. *A. Lessingii* Boivin, Nat. Canad. **75:** 209. 1948, not *A. Lessingii* (Torr. & Gray) Greene, Pittonia **4:** 167. 1900.

TYPE: *J. F. G. Eschscholtz,* St. Lawrence Bay (and Eschscholtz Bay), 1815–18, Herb. Meyer. Leningrad. Type of *A. frigida* Meyer ex Iljin.

ARNICA LESSINGII (Torr. & Gray) Greene, Pittonia **4:** 167. 1900. *A. montana β angustifolia* Hook. Fl. Bor.-Am. **1:** 330, in part, 1833. *A. angustifolia β Lessingii* Torr. & Gray, Fl. N. Am. **2:** 449. 1843, not *A. alpina* var. *Lessingii* Gray, Syn. Fl. N. Am. **1²:** 383. 1884. *A. obtusifolia* Torr. & Gray, Fl. N. Am. **2:** 451. 1843, not *A. obtusifolia* Less. Linnaea **6:** 236. 1831. *A. obtusifolia* var. *acuta* Raup, Contr. Arnold Arb. **6:** 213. 1934. *A. Porsildiorum* Boivin, Nat. Canad. **75:** 210. 1948.

TYPE: *Captain Mulgrave,* Kotzebue's Sound, *sine no.* New York Botanical Garden. Not at the Greene Herbarium as suggested by Maguire (l. c. p. 488).[3]

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[3] A CORRECTION IN TERMINOLOGY—It is desirable at the same time to call attention to an additional error, one in terminology, made by me in my monograph of the genus Arnica (MAGUIRE, BASSETT. Brittonia **4:** 386–510. 1943). On page 400 I offered the following definition: "The periclinium begins at the point of insensible transition of peduncle into capitulum and terminates at the base of the involucral bracts." This usage was incorrectly attributed to Cavillier in his study of the genus *Doronicum* (CAVILLIER, F. Ann. Cons. Jard. Genève **14:** 215 and pl. 4. 1910). Cavillier properly used the term in its traditional and etymologically correct sense to indicate the involucre.

The term *hypocephalum* does accurately designate this region of such taxonomic importance in *Arnica* and other *Compositae.* It should so be read in all instances where I have used the term *periclinium.*—B. M.

ARNICA MOLLIS AND A. LANCEOLATA

M. L. Fernald

Being asked why, in the 8th edition of Gray's Manual (1950), I do not maintain the eastern *Arnica lanceolata* Nutt. as distinct from the cordilleran *A. mollis* Hook., I am presenting a somewhat detailed reply.

Although most students of the group have found no fundamental specific characters to distinguish the more common *Arnica* of eastern Canada, northern New England and northeastern New York from the cordilleran *A. mollis* Hook., Dr. Bassett Maguire in his *Monograph of the Genus Arnica* in Brittonia, iv. no. 3 (1943), especially on pp. 471, 474 and 475 and 477–481, keeps them apart as wholly satisfactory species. This is the more striking since he sees only subspecies, varieties, races, etc., in other localized plants of Newfoundland and the Gaspé region which have far more stability than does *A. lanceolata* Nutt., reputedly strictly eastern representative of the supposedly strictly western *A. mollis.* At two different times in the past I have published my conclusion, based on a stack of herbarium-sheets which closely crowd two standard pigeon-holes; but, in view of the seeming conclusiveness of Maguire's treatment, we find eastern botanists calling the plant of Quebec, New Brunswick and New England *A. lanceolata.* To this group I do not belong.

In Maguire's key (his p. 471) we get the two elements separated as follows:

A. Cauline leaves 4–10 pairs (rarely only 3, and then the periclinium not long-stipitate-glandular), coarsely serrate, or serrate-dentate.
  B. Periclinium long-stipitate-glandular
    C. Cauline leaves 5–10 pairs (rarely only 3–4); heads 5–9 (rarely 1–3); plants of western North America. .23. *A. amplexicaulis.*
    C. Cauline leaves 4 or only 3 pairs (rarely 5); heads 1–3 (rarely 5); plants of northeastern North America. . . .25. *A. lanceolata.*

. . . .

A. Cauline leaves 3 pairs (rarely 4), denticulate, seldom serrate; periclinium long-stipitate-glandular.
  B. Heads radiate.
    C. Immature heads erect, lower portion of stem and leaves not lanate-pilose; pappus tawny, mostly plumose, the setae 0.3 (0.24)–0.45 (0.6) mm. long. . . . . .26. *A. mollis.*

Noting that the last "C" is in contrast with *Arnica Parryi*, not with no. 24, *A. lanceolata*, we are left, as the key-differences between the "northeastern" *A. lanceolata* and the western *A. mollis:*

Cauline leaves 4 or only 3 pairs (rarely 5) and if only 3, then the periclinium not long-stipitate-glandular, the leaves coarsely serrate of serrate-dentate; heads 1–3 (rarely 5)....*A. lanceolata.*
Cauline leaves 3 pairs (rarely 4), denticulate, seldom serrate; periclinium long-stipitate-glandular........................*A. mollis.*

Now Nuttall's original description of *A. lanceolata* said "stem leaves about three pairs, semiamplexicaule." In a subcespitose or closely tufted plant it is difficult to say just what have been counted as cauline leaves, for very often the definitely petioled leaves extend well up the stem, while in the minor *A. mollis*, var. *petiolaris* Fern. of relatively low altitudes in New England and eastern Canada, nearly all the cauline leaves taper at base to petioles; 2 or 3 pairs of cauline leaves are the rule in the eastern plant; 1, 4 or 5 very exceptional. Surely, however, the individuals with 3 pairs have just as many stipitate glands on the involucre as do the others. The character "heads 1–3 (rarely 5)" would give a more accurate picture of the eastern plant if the parenthetical phrase read (rarely –9). The great majority of flowering stems of the eastern plant have 1 or 3 heads, those in the Gray Herbarium giving the following percentages: 1 head, 37%; 2 heads, 12%; 3 heads, 43%; with 4, 5, 6, 7, 8 and 9 making up meagre portions of the remaining 8%. In the fuller account, p. 477, the number of heads of the western *A. mollis* is given as "1–3 (5)", exactly as for the eastern *A. lanceolata;* and, although from the key one gathers that plants of *A. lanceolata* with pairs of cauline leaves "only 3 [a common number]" have "the periclinium not long-stipitate-glandular", the full description (p. 475) clearly says of it "periclinium obviously long-stipitate-glandular." Thus one becomes quite perplexed and resorts to leaf-outline, toothing and other characters. Any variation of leaf-outline and toothing in the leaves of *A. mollis* can be promptly matched by those of *A. lanceolata;* so can the involucres, both in shape and size, and the achenes.

After a third study of the two isolated branches of *Arnica mollis,* I find myself as incapable as heretofore of seeing two species in it.

In its segregation into two areas, one in western, the other in eastern North America (especially in southeastern Canada or the adjacent northeastern United States) it becomes a member of a very large group of species with similarly disrupted range. They were long ago isolated by the development of the arid Great Plains, the aridity and the increased alkalinity of the standing waters evidently excluding many of the terrestrial and most of the aquatic species of the two relict areas. In view of his well known tendency to "split" whenever possible, it is significant that Rydberg treated as identical such western and eastern groups of many bicentric species: for instance, *Potamogeton Robbinsii*, *P. obtusifolius*, *P. amplifolius*, *P. epihydrus*, *Najas flexilis*, *Scirpus subterminalis*, *S. heterochaetus*, *Habenaria unalascensis* (*Piperia*), *Goodyera oblongifolia* (*G. decipiens*), *Corallorhiza striata*, *Arenaria macrophylla* (*Moehringia*), *Cerastium beeringianum*, *Parnassia Kotzebuei*, *Dryas Drummondii*, *Oxytropis foliolosa*, *Hedysarum Mackenzii*, *Osmorhiza obtusa*, *Vaccinium ovalifolium*, *Lonicera involucrata*, etc., etc. These and *Arnica mollis* belong in the same geographically disrupted group.

But how different would seem to have been Rydberg's work on *Arnica!* Of 43 species of *Arnica* described or named by him 42 are reduced to outright synonymy by Maguire. Of the value of such wholesale reduction I am not in a position to judge. Both of these authors maintained as distinct species *A. mollis* and *A. lanceolata*. I am, after repeated attempts, unable to follow either of them in this specific separation; and so many points in Maguire's extended monograph show inattention to details, that one naturally wonders about the finality of the work.

On his p. 494, he published, as fig. 21, a map said to show "World distribution of the genus *Arnica*." In North America his southern boundary for the genus extends across Lake Winnipeg, thence slightly south of Hudson Bay, thence northward into the northern half of the Labrador Peninsula, and finally with a continuous tongue running southwestward from the eastern half of the Labrador Peninsula and easternmost Newfoundland without a break to Florida, thus including all central, eastern and southern Newfoundland, the Magdalen Islands, Prince Edward Island, southern New Brunswick, Nova Scotia, southern Maine, southern New Hampshire, southern Vermont, Massachusetts,

Rhode Island, Connecticut, Long Island and southern New York, New Jersey and much other terrain where no *Arnica* is known. On the other hand, the exclusion of any *Arnica* from the region of Lake Superior (map 21) is not easily reconciled with his map 6 (on p. 429), where his *A. lonchophylla*, ssp. *arnoglossa* is shown from just north of Lake Superior. Map 6 also shows *A. lonchophylla*, ssp. *chionopappa*, i. e. *A. chionopappa* Fern., with many stations in the waters of the Gulf of St. Lawrence, along the eastern half of the North Peninsula of Newfoundland, whence it is unknown; while the single New Brunswick station, calcareous ledges at Sisson Gorge on the Tobique River, emptying into the St. John in northwestern New Brunswick, is mapped as being in the noncalcareous eastern section, near the mouth of the Mirimichi which empties into the Gulf of St. Lawrence. Again, the endemic *A. Whitneyi* Fern. (appearing as *A. cordifolia*, ssp. *Whitneyi* (Fern.) Maguire), is correctly stated on p. 452 to be known only from Keweenaw County, Michigan, but on the map (fig. 10) it seems to be recorded from other counties and even to occur south of the Straits of Mackinac. Be that as it may, the gap of 250 miles north of Keweenaw Peninsula, on map 21, before reaching the southern limit of the genus in that longitude, is not supported by the facts which the author himself definitely stated.

Turning to Europe, the same disregard of readily available data is unfortunately evident. Map 21 shows all of Sweden supporting the genus, but the southwestern half of Norway lacking it, although reference to Hartman, Skand. Fl. 8 (1879) would have shown that *Arnica montana* in Norway extends northward to Trondhjem. The detailed map of Hultén's Atlas (1950) shows this southern Norwegian area, but no *Arnica* in Sweden except in the southern half of that country. Southeastward in Europe Maguire's map shows a tongue extending only to the Pyrenees. Had he consulted such an old standard as Nyman's Conspectus he would have found Spain and Portugal both entered for *A. montana*. Consultation of the Compend. Fl. Española of Lázaro e Ibiza, ed. 3 (1920) would have shown not only two characteristic illustrations of the plant, but the statement that it occurs on the mountains across northern Spain ("Montañas elevatas del NE., N. y O."). Similarly Pereira

Coutinho's Flora de Portugal (1913) would have given full confirmation of its occurrence in Portugal. Singularly enough (and somewhat sadly), Maguire's map 19 (p. 487) of the range of *A. montana* has a single dot for the Cantabrian Mts. of northern Spain, but even that did not get on the ostensibly complete map (21) of the full range of the genus.

All this digression from *Arnica mollis* may seem superfluous, but when an author so far departs from the conceptions and conclusions of others as does the author of the extended treatment of *Arnica*, it becomes important to check his accuracy in other details. It seems evident that a reconsideration of the genus and its distribution may become desirable. That Maguire now sees that some of his statements have been misleading is clear from his article which immediately precedes this discussion.

Extension of Solidago erecta.—When a species new to Quincy, Massachusetts, an area well explored by the earlier botanists, is found, it seems worthy of a brief note.

While collecting desmids in the little pools of the old Quincy quarries, what at first I took to be *Solidago caesia* L. attracted my attention because the upper leaves were reduced, contrary to the usual way in that species. As I was getting desmids, not flowering plants on that trip, I merely grabbed one specimen. Being wholly unfamiliar with *Solidago erecta* Pursh, it was not until I had reached home that I discovered I had found this species and not *Solidago caesia*.

Mr. F. W. Hunnewell kindly confirmed my recollection that it had not previously been found north of Cape Cod, Massachusetts. The one (alas!) specimen has been deposited in the herbarium of the New England Botanical Club. Perhaps further exploration will uncover stations for this southern species to fill in the gap between Cape Cod and Quincy.—Frank C. Seymour, Tomahawk, Wis.

DEEP-FREEZING FLOWERS FOR LABORATORY INSTRUCTION IN SYSTEMATIC BOTANY

Reed C. Rollins

Electrical deep-freezing machines are widely used in American homes for the preservation of frozen foods. Their general availability and economical operation suggested the possibility of their use to preserve fresh botanical material for use in laboratory instruction. Apparently a number of persons have been similarly impressed by such possibilities and at least two short notes, Baker (1949) and Harrington (1950), have appeared indicating success in this direction. However, in 1948, when I began preparations for a test run on a variety of different flowers that might appropriately be used in teaching taxonomic botany, no guiding information was available. Now, a fairly wide selection of angiosperm flowers has been used in laboratory instruction after having been preserved in a deep-freezer for periods of eight to fourteen months. For teaching purposes, the superiority of these materials over pickled or dried specimens is very striking. Not only are the shapes and color of most flowers kept intact, but even the characteristic odors are preserved in many instances. The results obtained, I believe, justify the prediction that a deep-freezer will become an indispensable adjunct to most taxonomic laboratories and may be found very useful for instruction in other branches of botany. It is particularly needed in areas where the seasons preclude easy access throughout the year to flowering plants growing in the wild. But even in the warmer climates, the deep-freezer may be used to keep material for introduction to the students in a more logical sequence than is often possible from naturally growing plants.

The advantages of frozen flowers are similar to those of fresh material over dried or pickled specimens. The student is permitted to formulate a three-dimensional concept of the flowers studied and may easily obtain an accurate picture of the positional relationships of the flower parts. When first removed from the freezer, the flowers are frozen stiff. As thawing takes place, they become less turgid and ultimately wilt. It has been found effective to pass the specimens to the students in the frozen

condition so that preliminary observations may be made immediately. Dissections follow as the material becomes sufficiently pliable to allow manipulation.

Containers.—Some attention has been given to methods of packaging, in an attempt to find the most effective procedures and the most satisfactory containers for the purpose. Two types of stiff wax-impregnated paper containers were used. One type was cylindrical in shape, with a tight-fitting lid. This type was of pint ($3\frac{3}{8}''$ in diam.) and quart ($4\frac{1}{4}''$ in diam.) size. These are designated "round unsealed" in Table I. The material was placed directly into these containers, with no additional sealing except for the tight-fitting lid. The other type of container was a rectangular waxed paper carton of pint or quart size, together with an individual removable inner pliofilm bag. These are designated "rectangular sealed" in Table I. In using the latter, specimens were sealed inside the pliofilm bag by using heat to meld the edges together. The sealed bag was then placed inside the paper carton for storage.

Preparation of Material.—In preliminary trials, it was found that wilted specimens did not become turgid when placed in the deep-freezer. They froze in the wilted condition and were unusable. To prevent wilting, specimens were collected in a vasculum. If any wilting occurred, the cut ends of the stems were put in water until turgidity was restored. Flowers, or flower-clusters snipped from larger specimens, were put loosely into containers that in turn were placed immediately into the deep-freezer machine. The material was not pre-frozen in a special low-temperature compartment.

Flowers collected when rain was falling, or otherwise wetted before freezing, were in general unsatisfactory. Ice crystals commonly formed over the tissue-surfaces, or the parts became embedded in large or small pieces of ice. This made it difficult to handle the specimens for class distribution, although in most instances they were not completely ruined.

Sealing containers.—The commonest failure was caused by the drying-out of specimens. The sealed pliofilm bags were slightly more effective in preventing excessive drying than were the cylindrical containers, but more work was involved in putting up the material. Manufacturers recommend the use of an ordinary

clothes iron for sealing the pliofilm bags, but I found a hot incandescent electric light bulb to be equally effective and much less trouble. A half-inch margin at the open end of the bag was pressed momentarily against a lighted, firmly anchored light bulb. Sealing was immediate. The rectangular cartons, each holding a pliofilm bag, are easy to stack efficiently in the freezer and require much less room than comparable storage space provided by the cylindrical containers. The principal reason for using small individual cartons was to prevent crushing and facilitate finding the particular species when ready for use. However, if space is at a premium, I see no reason why a number of sealed pliofilm bags should not be put together in a larger carton than was used in these trials. In favor of the cylindrical cartons, it should be stated that they are easier to fill and material may be removed at intervals without breaking a permanent seal. These are items of convenience not to be too heavily discounted. An important consideration is the amount of unfilled space in a bag or carton. In those instances where the amount of material left the available space less than half-filled, there was more frequent drying-out than when the container was completely filled. This varied somewhat with the nature and succulence of the specimens but was sufficiently consistent to form the basis for a definite recommendation that the containers be full or nearly full for best results. On the other hand, pressing or packing the specimens too closely is not a good practice, for they freeze together and become distorted in shape.

Temperature.—No special mechanism for temperature control, other than that already on the General Electric deep-freezer, was used. The regulator was set to keep the temperature below − 10° C. Actually, as set, the regulator permitted a range from − 10° to − 20° C. (+ 18° to − 4° F.). This temperature range seemed satisfactory for the purpose and was not altered during the test.

Results.—The results of deep-freezer trials on a variety of plants are presented in tabular form below. We have attempted to give an overall estimate of the usefulness of the method for each species, in the column "satisfactory vs. unsatisfactory for laboratory use." There was no attempt to try material from every family of the Angiosperms, those species most easily

available being used. However, the range of material is sufficiently wide to demonstrate the effectiveness of the method. The results are really self-evident, but an examination of the table points up the fact that either type of container is satisfactory for the purpose. By far the largest majority of flowers showed good color and texture. The most common wilting time, after the material was taken from the freezer and exposed to the open air of the laboratory, was between 10 and 60 minutes. In general, there was ample time for the student to make proper preliminary observations before wilting set in, and in only a few cases was wilting so rapid that the material was unsatisfactory for laboratory use.

To give the interested person the benefit of my experience, the following items in connection with procedure are noted:

(1) Be sure the specimens are neither wilted nor wet when placed in the deep-freezer.

(2) Prevent drying of the specimens by placing them in sealed or semi-sealed containers.

(3) The bulk of the specimens should exceed half of the total space inside the container for best results.

(4) In order to permit easy removal and separation of the material, do not pack it too tightly.

(5) In general, relatively small containers (i. e. half-pint, pint or quart size) are preferable to larger ones because they eliminate crushing due to the weight of a large mass of material. However, this depends in part upon the size and type of material being frozen, as well as the nature of the prepared specimen. I have usually frozen only the flowers and fruits, and these have been supplemented with dried specimens for teaching purposes.

(7) The temperature of the deep-freezer should be below the freezing point of water at all times. Fluctuations from − 10° to − 20° C. (+ 18° to − 4° F.) were not harmful to the material and allowed for a considerable margin of safety in connection with the operation of the machine.

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Harrington, H. D. 1950. Preserving Flowers by Freezing. Turtox News **28**: 51.

TABLE I

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Gramineae												
Agropyron repens (L.) Beauv.		×	×		×				×	×		
Anthoxanthum odoratum L.	×		×		×				×	×		
Danthonia spicata (L.) Beauv.		×	×		×				×	×		
Festuca rubra L.		×	×		×				×	×		
Cyperaceae												
Carex stricta Lam.	×		×		×			×		×		
Araceae												
Arisaema Stewardsonii Britt.	×		×		×			×		×		
Calla palustris L.		×		×		×					×	Thawed and refrozen.
Symplocarpus foetidus (L.) Nutt.	×		×		×			×		×		
Commelinaceae												
Tradescantia virginiana L.		×	×		×		×			×		Wilts rapidly; dissected under water.
Juncaceae												
Juncus effusus L.		×	×		×				×	×		
Luzula campestris (L.) DC.	×		×		×				×	×		
Liliaceae												
Maianthemum canadense Desf.	×		×		×			×		×		Container open; material somewhat dry but good.
Polygonatum pubescens (Willd.) Pursh.	×		×		×			×		×		Bag broken; material still good.
Uvularia perfoliata L.	×		×		×			×		×		
Orchidaceae												
Cypripedium acaule Ait.	×		×		×			×		×		
Salicaceae												
Salix humilis Marsh, var. microphylla (Anderss.) Fern.	×		×		×				×	×		
Myricaceae												
Comptonia peregrina (L.) Coult.		×	×		×			×		×		
Corylaceae												
Alnus rugosa (Du Roi) Spreng.	×		×		×			×		×		
Betula populifolia Marsh	×		×		×			×		×		
Ostrya virginiana (Mill.) K. Koch	×		×		×			×		×		
Fagaceae												
Fagus grandifolia Ehrh.	×		×		×			×		×		
Quercus velutina Lam.	×		×		×				×	×		
Santalaceae												
Comandra umbellata (L.) Nutt.		×	×		×			×		×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Aristolochiaceae												
Asarum canadense L.	×		×		×				×	×		Thawed and refrozen but still very good.
Polygonaceae												
Polygonum persicaria L.		×	×		×			×		×		
Rumex acetosella L.		×	×		×			×		×		
Phytolaccaceae												
Phytolacca americana L.		×	×		×			×		×		
Caryophyllaceae												
Lychnis alba Mill.	×		×		×		×			?		Wilts rapidly; difficult to dissect.
Saponaria officinalis L.		×	×		×			×		?		Difficult to dissect.
Silene cucubalus Wibel		×	×		×					×		Wilted on removal.
Ranunculaceae												
Anemone quinquefolia L.	×		×		×			×		×		Flowers rapidly brown on thawing.
Aquilegia canadensis L.	×		×		×		×			×		Flowers retain odor.
Caltha palustris L.	×		×		×		×			×		Quite soft when thawed.
Ranunculus acris L.		×	×			×					×	Wilted at time of removal.
Ranunculus bulbosus L.		×	×		×			×		×		
Berberidaceae												
Berberis vulgaris L.	×		×		×				×	×		
Podophyllum peltatum L.		×	×		×				×	×		
Magnoliaceae												
Liriodendron tulipifera L.		×	×		×			×		×		Retain shape well.
Magnolia denudata Desrouss. (fls.)	×		×		×			×		×		Characteristic odor present.
Magnolia denudata Desrouss. (frt.)		×			×				×	×		
Lauraceae												
Sassafras albidum (Nutt.) Nees var. molle (Raf.) Fern.	×		×		×			×		×		
Papaveraceae												
Chelidonium majus L.	×		×		×		×			?		Difficult to dissect when wilted.
Dicentra canadensis (Goldie) Walp.		×	×		×			×		×		
Cruciferae												
Barbarea vulgaris R. Br. (fls.)	×		×		×			×		×		Wilts only partially when thawed.
Barbarea vulgaris R. Br. (frt.)		×	×		×			×		×		Wilts only partially when thawed.
Brassica campestris L.		×	×		×			×		×		Wilts only partially when thawed.
Capsella bursa-pastoris (L.) Medic.	×		×		×			×		×		Wilts only partially when thawed.
Dithyrea Wislizenii Engelm.		×	×		×			×		×		Wilts only partially when thawed.

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Saxifragaceae												
Philadelphus inodorus L.		×		×		×		×		×		Dried in container.
Saxifraga virginiensis Michx.		×	×		×			×		×		
Hamamelidaceae												
Fothergilla major (Sims) Lodd.	×		×		×				×	×		
Rosaceae												
Crataegus (hybrid)	×		×		×			×		×		Browns rapidly.
Potentilla simplex Michx.	×		×		×			×		×		Wilts only partially.
Prunus pensylvanica L.	×		×		×			×		×		
Pyrus melanocarpa (Michx.) Willd.	×			×	×			×		×		Thawed and refrozen before use.
Rhodotypos scandens (Thunb.) Mak.		×	×		×			×		×		Wilts only partially.
Rubus sp.		×	×		×			×		×		Wilts only partially.
Leguminosae												
Cercis canadensis L.	×		×		×			×		×		
Cladrastis lutea (Mich. f.) K. Koch.	×		×		×				×	×		
Robinia pseudoacacia L.		×	×		×				×	×		
Trifolium pratense L.		×	×			×				×		Partially dried in container.
Wisteria sinensis Sweet	×		×		×			×		×		
Geraniaceae												
Geranium maculatum L.	×		×			×		×		×		Slightly wilted on opening; petals fall easily.
Oxalidaceae												
Oxalis stricta L.	×		×			×	×				×	Very soft when thawed; difficult to dissect.
Polygalaceae												
Polygala paucifolia Willd.	×		×		×			×		×		
Euphorbiaceae												
Euphorbia cyparissias L.	×		×		×			×		×		Soft but easily dissected.
Celastraceae												
Celastrus scandens L.		×	×		×			×		×		
Aceraceae												
Acer negundo L.	×		×		×			×		×		
Acer platanoides L.	×		×		×			×		×		
Hippocastanaceae												
Aesculus glabra Willd.	×		×		×			×		×		
Vitaceae												
Vitis Labrusca L.		×	×		×				×	×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Tiliaceae												
Tilia americana L.		×	×		×				×	×		
Malvaceae												
Hibiscus syriacus L.	×		×		×				×	×		Mucilaginous quality preserved.
Guttiferae												
Hypericum perforatum L.		×	×			×			×	×		Partly wilted on opening.
Violaceae												
Viola fimbriatula Sm.	×		×		×			×		×		
Onagraceae												
Oenothera biennis L.		×	×		×			×		×		Top flowers partially dried.
Araliaceae												
Aralia nudicaulis L.	×		×		×			×		×		
Cornaceae												
Cornus alternifolia L. f.		×	×		×			×		×		Stand up well on thawing.
Cornus amomum Mill.		×	×		×			×		×		Stand up well on thawing.
Cornus stolonifera Michx.	×		×		×				×	×		Stand up well on thawing.
Ericaceae												
Pieris floribunda (Pursh) B. & H.	×		×		×				×	×		
Rhododendron canadense (L.) Torr.	×		×		×			×		×		Wilts only partially; pores on anthers good.
Vaccinium angustifolium Ait.	×		×		×			×		×		Flowers change from white to dirty brown.
Vaccinium corymbosum L.	×		×		×			×		×		Flowers brown in ½ hr.
Primulaceae												
Trientalis borealis Raf.	×		×		×		×			?	?	Wilts on exposure.
Styracaceae												
Halesia carolina L.		×	×		×			×		×		Gynoecium difficult to dissect.
Symplocaceae												
Symplocos tinctoria (L.) L'Her.	×		×		×			×		×		
Oleaceae												
Forsythia (hybrid)	×			×		×				×		Wilted on removal; softens excessively.
Syringa vulgaris L.	×		×		×			×		×		
Apocynaceae												
Vinca minor L.	×		×		×		×			×		
Asclepiadaceae												
Asclepias syriaca L.		×	×		×			×		×		

TABLE I—Continued

Name	Container		Natural Flower Color		Texture of Flower Parts		Wilting time in open air			For lab. use		Remarks
	Rect. Sealed	Round Unsealed	Good	Poor	Good	Poor	< 10 min.	10-60 min.	1-3 hrs.	Satis-factory	Unsatis-factory	
Labiatae												
Trichostema dichotomum L.	×		×		×			×		×		
Solanaceae												
Solanum triflorum L.		×	×		×			×		×		
Scrophulariaceae												
Linaria canadensis (L.) Dumont	×		×			×		×		×		Somewhat wilted in container.
Linaria vulgaris Hill	×		×		×			×		×		
Pedicularis canadensis L.	×			×		×		×		×		
Veronica serpyllifolia L.	×		×		×			×		×		
Bignoniaceae												
Catalpa bignonioides Walt.		×	×		×			×		×		
Plantaginaceae												
Plantago lanceolata L.	×		×		×			×		?	?	Difficult to dissect.
Rubiaceae												
Houstonia caerulea L.	×		×		×			×		×		
Caprifoliaceae												
Lonicera Morrowi Gray	×		×		×		×				×	Corolla wilts rapidly to pulpy mass.
Sambucus canadensis L.		×	×		×			×		×		Browns rapidly on thawing.
Viburnum bitchiuense Mak.	×		×		×			×		×		Browns after thawing.
Campanulaceae												
Campanula rapunculoides L.	×		×			×		×			?	Dry in container; too little material.
Lobelia cardinalis L.		×	×		×			×		×		
Compositae												
Antennaria plantaginifolia (L.) Hook.	×		×		×			×		×		
Agoseris cuspidata (Pursh) Raf.		×	×		×			×		×		
Aster ericoides L.		×	×		×			×		×		
Cichorium intybus L.		×	×		×			×		×		
Chrysanthemum leucanthemum L.		×	×		×			×		×		Rays wilt rapidly.
Helianthus annuus L.		×	×		×				×	×		
Senecio aureus L.		×	×			×		×		×		
Silphium perfoliatum L.		×	×		×			×		×		
Solidago sempervirens L.	×		×		×			×		×		
Vernonia noveboracensis (L.) Michx.		×	×		×				×	×		

NEW PLASTIC AID IN MOUNTING HERBARIUM SPECIMENS

W. Andrew Archer

The proper mounting of plant specimens on sheets for permanent reference is one of the factors which lead to high costs in herbarium maintenance. In an attempt to shorten the process, plastics have been under investigation for a period of years. The use of plastic as described below has resulted in considerable saving of time and yields a better mount with higher permanence than anything used up to the present in herbarium practice.

Preliminary experiments with plastics as an aid in mounting herbarium specimens were made first with Duco cement. This cement, however, contains cellulose nitrate, a substance subject to disintegration after a period of years. Other plastics, such as ethyl cellulose or cellulose acetate, are considered permanently stable and consequently suitable for herbarium purposes.

Acting on suggestions first made by Dr. G. R. Fessenden, formerly of the U. S. Department of Agriculture, and later by chemists of the National Bureau of Standards and of the Dow Chemical Company, various combinations of ingredients were tested, leading finally to the following formula: Toluene—800 cc.; methanol—200 cc.; ethyl cellulose (Ethocel) standard 7 cps.—250 gr.; plasticized with Dow Resin 276 V-2—75 gr. (The two latter ingredients are available only from the Dow Chemical Company, Midland, Michigan.)

To use the medium for mounting, the specimen is weighted down on the herbarium sheet with any convenient small objects placed at proper intervals to keep the plant flat. The plastic is applied by means of an ordinary, 6 ounce oil-can in a thin band over the part to be fastened, and the specimen then left in place for about 20 minutes to permit evaporation of the solvent and hardening of the plastic.

At present the plastic is substituted for nearly all of the sewing usually involved in the technique of mounting with tape or glue. It is particularly useful for mounting coarser plants such as grasses, sedges, palms and oaks. The results are satisfactory enough to warrant adoption of the method as a standard herbarium practice.

This note is presented in the hope of encouraging further improvement of the method. A special type of container might be designed to dispense the plastic in variable quantities according to the need. Furthermore, technical supervision is required to maintain the various components in a moisture-free condition, otherwise the plastic may become milky instead of transparent upon drying. This fact might render the method impractical for many herbaria, but some commercial house might stock the preparation ready for use were the demand sufficient.

Herbarium, United States National Arboretum,
Beltsville, Maryland

Dalea alopecuroides on Plum Island, Essex County, Massachusetts.—On September 3, 1950, while birding on Plum Island in the region known as "Hellcat Swamp," I noticed an unfamiliar legume. Taking the specimen, which grew in sandy soil four miles south of the Plum Island Causeway, I found it was apparently *Dalea alopecuroides.* The identification was confirmed by Dr. L. M. Perry of the Arnold Arboretum, and the plant added to the Essex County herbarium. Gray's Manual, 8th edition, gives the range as "adventive east to New York," but Dr. Stuart Harris kindly informs me that there are two previous stations from the state, one on South Boston flats, the other in the Arboretum, and that the Plum Island plant is the first known outside of metropolitan Boston. Since this area is not much travelled and the thickets sometimes yield species of birds rare or accidental in the state, one may speculate whether the seeds were brought in by their agency.—Dorothy E. Snyder, Peabody Museum, Salem.

Volume 52, no. 623, including pages 253–280, was issued 20 November, 1950.

ERRATA

Page 19, line 22; for *Boutelous* read *Bouteloua.*
Page 19, line 25; for *texana* read *texanus.*
Page 20, line 6; for *Sueada* read *Suaeda.*
Page 20, line 11; for *Barlandieri* read *Berlandieri.*
Page 22, line 11; for COMPRESSUES read COMPRESSUS.
Cover No. 614, line 22; for **alpine** read **alpina.**
Page 36, line 1; for CYNOSCIDUM read CYNOSCIDIUM.
Page 40, lines 17, 26, 27, 38; for *Liatrus* read *Liatris.*
Page 51, line 11; for *Otto* read *Orator.*
Page 53, line 14; for CANADENSIS read CANADENSE.
Page 58, line 23; for PLOX read PHLOX.
Cover No. 617, line 12; for **Formadehyde** read **Formaldehyde.**
Page 75, line 4; for *coscinodon* read *Coscinodon.*
Page 79, last line; for *Uva* read *Uva-*
Page 86, line 10; for PAPILLARIS read PAPILLARIA.
Page 95, last line; *for* Fig. 1 *read* Fig. 2.
Page 96, line 4; *for* Fig. 2 *read* Fig. 1.
Page 100, line 10; for *Podestelides* read *Podostelides.*
Page 126, line 7; for **fuscicolus** read **fuscicolor.**
Page 126, line 8; for *fuscicola* read *fuscicolor.*
Page 126, line 9; *for* 1939 *read* 1839.
Page 126, line 23; for *fuscicolus* read *fuscicolor.*
Page 131, line 24; for *stewardsonii* read *Stewardsonii.*
Page 155, line 7; *for* Ell. *read* Darl.
Page 158, line 6; *for* tules *read* rules.
Page 172, line 3; for ELEAEGNIFOLIUM read ELAEAGNIFOLIUM.
Page 173, line 11; for HEMAESPHERICUS read HEMISPHERICUS.
Page 177, line 26; *for* enthusuastic *read* enthusiastic.
Page 180, line 34; for *cassionoides* read *cassinoides.*
Page 183, line 3; *for* Herbaium *read* Herbarium.
Page 193, line 8–9; for *carolina-septentronalis* read *carolinae-septentrionalis.*
Cover No. 621, line 21; for **238** read **228.**
Page 210, line 34; for *villosum* read *villosus.*
Page 232, lines 12 & 13; *for* Chattachoochee *read* Chattahoochee.
Page 234–35, last of key; read 9 for 8; 10 for 9; 11 for 10; 12 for 11; 13 for 12.
Page 238, line 30; *for* 1940 *read* 1840.
Page 251, line 40; *for* forword *read* foreword.

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New scientific names and combinations are printed in boldface type

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